04- 3- 1; 6:15PM;NGB 特許部 富士フイルム(吉田南) ;0355613955 # 2/ 8

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Kenichiro Sato et al. : Group Art Unit: 1752

Appln. No.: 09/834,639 : Examiner: THORNTON, YVETTE C

Filed: April 16, 2001 :

For: POSITIVE PHOTORESIST COMPOSITION

DECLARATION UNDER 37 C.F.R. §1.132

Assistant Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

I, Kenichiro Sato, do declare and state as follows:

I am a citizen of Japan.

I graduated from Osaka University, Faculty of Engineering, Course of Applied Fine Chemistry in March 1992.

Since April 1992 I have been employed by Fuji Photo Film Co., Ltd. and have been engaged in research and development of photoresist photosensitive materials for semiconductors at the Yoshida-Minami Factory Research Division of the company.

I am a co-inventor of the invention described and claimed in the above-named application, and I am familiar with the subject matter disclosed by the application.

In order to demonstrate the unexpected superiority of the present invention, the following experimentation was conducted by me or under my supervision.

04- 3- 2; 6:34PM;NGB 特許部 SUGHRUE(1) ;0355613955 # 3/ 8

EXPERIMENTATION

EXAMPLES A-1 TO F-4 AND COMPARATIVE EXAMPLES a-1 TO f-4

Positive photoresist compositions using the resin and the photo-acid generator, and if necessary, the surface active agent and the basic compound, which are set forth in Table C below were prepared in the same manner as in Examples 2-1 to 2-18 of the present specification.

In Table C, Resins (2-1), (2-2), (2-3) and (2-9) are the resins described in the present specification, respectively. PAG4-50 is the compound described on page 80 of the present specification, and W-4 (polyoxyethylene nonylphenyl ether: a surfactant other than a fluorine-type and silicon-type surfactant) and W-5 (silicon-type surfactant; Troysol S-366, a product of Troy Chemical K. K.) are surfactants described on page 124 of the present specification. The Polymers (34) and (35), PAG 1, PGMEA, FC-430 (Fluorine-type surfactant) and tributylamine are compounds described in U.S.P. 6,280,898 (Hasegawa).

The positive photoresist compositions were evaluated on Edge Roughness (ER) and Number of Developing Defects in the same manner as in Examples 2-1 to 2-18 of the present specification. The results are shown in Table C below.

04- 3- 2; 6:34PM;NGB 特許部 富士フイルム(西出様) ;0355613955 # 4/ 8

TABLE C

	Resin	Acid Generator	Solvent	Surfactant	Organic Basic Compound	LER	Number of Development Defects
Example A-1	2-1	PAG 4-50	PGMEA	None	None	18 nm	170
A-2	2-2					18 nm	160
A-3	2-3					19 nm	165
A-4	2-9					19 nm	160
Comparative Example a-1	(35)					35 nm	8620
a-2	(35)	PAG 1				36 nm	24040
a-3	(34)	PAG 4-50				37 nm	34120
a-4	(34)	PAG 1				36 nm	35410
Example B-1	2-1	PAG 4-50	PGMEA	W-5	None	16 nm	80
B-2	2-2					16 nm	75
B-3	2-3					16 nm	88
B-4	2-9					16 nm	72
Comparative Example b-1	(35)					30 nm	3520
b-2	(35)	PAG 1				29 nm	2910
b-3	(34)	PAG 4-50				30 nm	3710
b-4	(34)	PAG 1				30 nm	2990

TABLE C (continued)

Example C-1	2-1	PAG 4-50	PGMEA	W-4	None	18 nm	120
	C-2	2-2				17 nm	105
	C-3	2-3				18 nm	115
	C-4	2-9				18 nm	112
Comparative Example c-1	(35)					35 nm	5540
c-2	(35)	PAG 1				34 nm	4970
c-3	(34)	PAG 4-50				34 nm	5220
c-4	(34)	PAG 1				33 nm	4945
Example D-1	2-1	PAG 4-50	PGMEA	EC 430	None	16 nm	78
D-2	2-2					16 nm	74
D-3	2-3					17 nm	83
D-4	2-9					16 nm	70
Comparative Example d-1	(35)					30 nm	3410
d-2	(35)	PAG 1				29 nm	2970
d-3	(34)	PAG 4-50				30 nm	2740
d-4	(34)	PAG 1				30 nm	2890

TABLE C (continued)

Example E-1	2-1	PAG 1	PGMEA	None	Tributylamine	15 nm	75		
E-2	2-1			W-5		12 nm	35		
E-3	2-1			W-4		15 nm	87		
Comparative Example e-1	(35)			None		20 nm	2830		
e-2	(34)			W-5		26 nm	2460		
e-3	(35)			W-4		28 nm	2710		
Example F-1	2-1	PAG 4-50	PGMEA	FC 430	Tributylamine	12 nm	38		
F-2	2-2					14 nm	45		
F-3	2-3					12 nm	40		
F-4	2-9					12 nm	35		
Comparative Example f-1	(35)					20 nm	1290		
Comparative Example f-2	(35)	PAG 1				25 nm	2320		
Example f-3	(34)	PAG 4-50				21 nm	1170		
Comparative Example f-4	(34)	PAG 1				27 nm	2290		

As is evident from the comparison of Additional Examples A-1 to A-4 with Comparative Examples a-1 to a-4, the feature of the present invention can be seen that specific effects can be obtained as regards LER and development defect owing to the use of a resin having a specific structure even for systems not containing any surfactant or organic basic compound.

In addition, in Additional Examples B-1 to B-4 with Comparative Examples b-1 to b-4, Additional Examples C-1 to C-4 with Comparative Examples c-1 to c-4, and Additional Examples D-1 to D-4 with Comparative Examples d-1 to d-4, advantageous effects of the present invention are not attained with use of Resin (34) or (35) set forth in cited reference Hasegawa. For confirmation, when those systems each containing a surfactant are compared with Examples of Additional Examples A-1 to A-4, it is apparent that still more preferable results are attained concerning LER and development defect due to the addition of a surfactant. (However, the surfactant is not an essential ingredient, but one used for preferable embodiments for the present invention.)

Moreover, by comparing Additional Example E-1 with Comparative Example e-1, or Additional Examples E-2 and E-3 with Comparative Examples e-2 and e-3, it is confirmed that the addition of an organic basic compound also gives more preferable results concerning LER and development defect.

As has been discussed heretofore, the present invention achieved unexpected excellent effects by introducing a specific resin, and is not obvious in view of the cited reference which specifically discloses nothing about the resin having the specific structure.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectively submitted,

Date: March 2, 2004

Kenichiro Sato

Kenichiro Sato